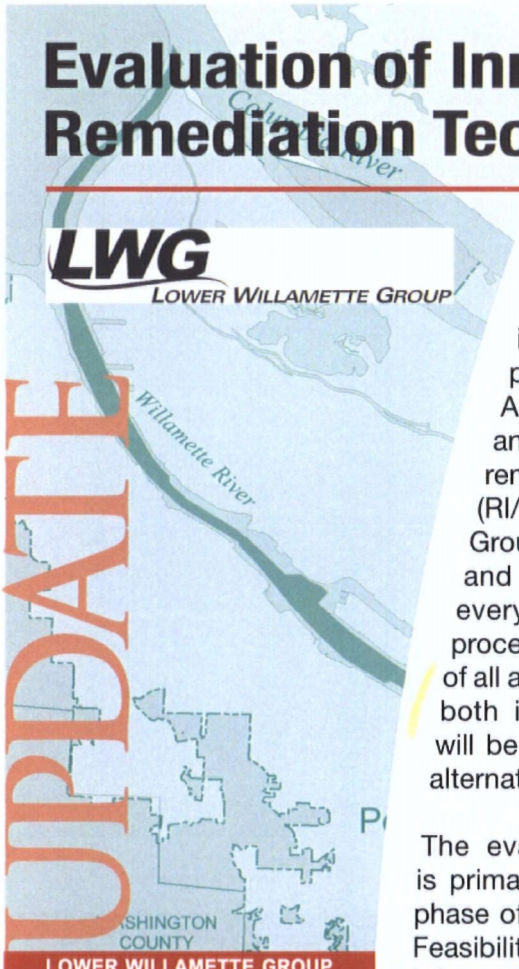
Evaluation of Innovative Remediation Technologies

JUNE 2006

for the Portland Harbor Superfund Site



The evaluation of remedial technologies is a very important part of the Superfund process and is required by the Administrative Order on Consent (AOC) and Statement of Work (SOW) during the remedial investigation and feasibility study (RI/FS). Specifically, the Lower Willamette Group (LWG) is required to identify, screen and document remedial technologies for every proposed action at the site. This process starts with a comprehensive review of all available remedial technologies available, both innovative and more standard, which will be used to build comprehensive remedial alternatives for the site.

Evaluation Criteria

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate requirements
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility or volume
5. Short-term effectiveness
6. Implementability

The evaluation of remediation technologies is primarily conducted in the Feasibility Study phase of the Superfund Remedial Investigation/ Feasibility Study (RI/FS). This includes gathering information on all of the available technologies and identifying those innovative and standard technologies that will be used together to develop site-wide comprehensive "Remedial Alternatives".

Each Remedial Alternative evaluated will consist of a combination of innovative and standard technologies which may be applied to portions of the site. Therefore, a Remedial Alternative might include treatment in one area, dredging and disposal in another, capping in yet another, etc. The combined technologies determine the overall comprehensive Remedial Alternative for the site.

Many of these innovative technologies include techniques that are applied after the sediment is removed (e.g., sediment washing) as well as techniques that are applied with the sediments in place (in situ) such as placement of nutrients that encourage natural bacteria to degrade chemicals (bioremediation). In addition, other types of innovative technologies will be evaluated, such as adding reactive layers to sediment caps to better isolate chemicals in sediment in-place. Similarly, innovative dredging techniques to reduce chemical loss can be implemented during the dredging process, such as innovative containment features and removal techniques that lose less sediment at the point of removal.

Another important factor is the concept of beneficial reuse. Once removed and treated or partially treated, sediments may be suitable for a variety of upland uses, such as building or fill materials, or well treated sediments can sometimes be used for aquatic or shoreline habitat or beach restoration projects.

Treatment Technologies Review & Development

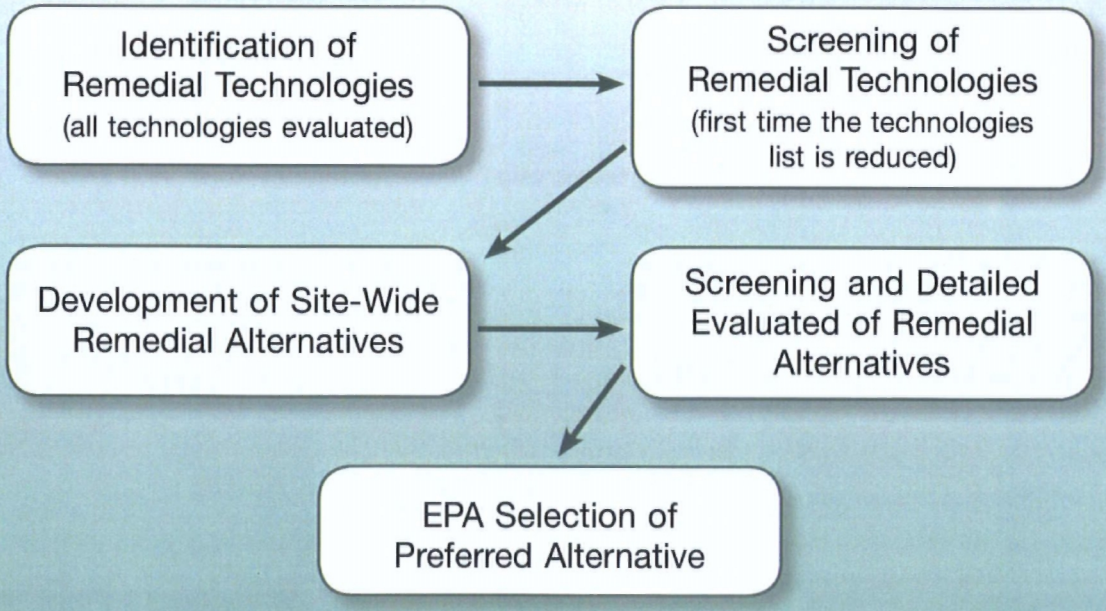
- Passive Dewatering
- Mechanical Dewatering
- Reagent Enhancement
- Particle Separation
- Blending with Amendments
- Stabilization/Solidification (in-situ and ex-situ)
- Sediment Washing
- Chemical Extraction
- Chemical Oxidation
- Dehalogenation
- Incineration
- Pyrolosis
- Thermal Desorption
- Vitrification (in-situ and ex-situ)
- Enhanced Bioremediation
- Phytoremediation
- Chemical Oxidation
- Electrochemical Remediation
- Reactive Capping
- Precision Dredging

Preliminary Studies (2003 – 2007)

TYPE	STANDARD TECHNOLOGIES	INNOVATIVE TECHNOLOGIES	PRELIMINARY RELEVANT STUDIES*	STATUS
Natural Recovery	Monitored Natural Recovery (MNR)	Enchanced MNR, Biological Amendments, Chemical Amendments, Aeration	MNR Technical Memos	Step 1 completed: Step 2 in 2006/2007. These and other technologies will be evaluated in FS.
Capping	Engineered Cap	Thin-Layer Capping: Reactive Layer Capping	Cap Material Availability Evaluation	Completed in 2003. These and other technologies will be evaluated in FS.
Dredging/Removal	Mechanical Dredging: Hydraulic Dredging: Upland Shoreline Removal	Precision Dredging, Advanced Dredging Containment BMPs, Closed Buckets, Dry Removal, Low Volume Hydraulic	None required.	These and other technologies will be evaluated in FS.
Treatment	Mechanical Dewatering, Passive Dewatering, Reagent Addition	Particle Separation, Blending, Stabilization, Washing, Chemical Extraction, Chemical Oxidation, Dehalogenation, Incineration, Pryolosis, Thermal Desorption, Vitrification, Bioremediation, Phytoremediation, Electrochemical	Treatment Technologies Literature Review, Treatability Studies	Literature Review 2006. Treatability Studies 2007 (as needed). These and other technologies will be evaluated in FS.
Disposal	Upland Disposal, Confined Aquatic Disposal, Nearshore Disposal	Beneficial Reuse: vitrified glass road grade, cement-stabilized construction fill, washed sands for habitat/beach restoration	Facility Siting Memos	Step 1 completed: Step 2 in 2007. These and other technologies will be evaluated in FS.

**These studies help to understand remedial technologies that could be applied to the site. No technologies are eliminated from consideration prior to the Feasibility Study.*

Feasibility Study Report (2007)



LWG
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